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November 12, 2019

VIA ELECTRONIC FILING

The Honorable Jocelyn G. Boyd
Chief Clerk/Administrator
Public Service Commission of South Carolina
101 Executive Center Drive, Suite 100
Columbia, South Carolina 29210

RE: South Carolina Energy Freedom Act (H.3659) Proceeding to Establish Duke Energy Carolinas, LLC's Standard Offer, Avoided Cost Methodologies, Form Contract Power Purchase Agreements, Commitment to Sell Forms, and Any Other Terms or Conditions Necessary (Includes Small Power Producers as Defined in 16 United States Code 796, as Amended) – S.C. Code Ann. Section 58-41-20(A)

South Carolina Energy Freedom Act (H.3659) Proceeding to Establish Duke Energy Progress, LLC's Standard Offer, Avoided Cost Methodologies, Form Contract Power Purchase Agreements, Commitment to Sell Forms, and Any Other Terms or Conditions Necessary (Includes Small Power Producers as Defined in 16 United States Code 796, as Amended) – S.C. Code Ann. Section 58-41-20(A)

Docket Nos. 2019-185-E and 2019-186-E

Dear Ms. Boyd:

Please find enclosed for filing the *Partial Proposed Order* and *Issue List for Commission Determination* of the South Carolina Coastal Conservation League ("CCL") and the Southern Alliance for Clean Energy ("SACE"). Please note that CCL and SACE's proposed order and issue list address certain issues (but not all issues) in these proceedings. CCL and SACE's proposed order and issue list primarily address Duke Energy's proposed seasonal allocation, capacity payments, and integration charge. CCL and SACE presented expert testimony regarding these issues.

Pursuant to the electronic service agreement in these dockets, we are serving a copy of the filings on all parties of record. A Microsoft Word version of the *Partial Proposed Order* and *Issue List* will be sent to the hearing officer for these proceedings.

Please contact me if you have any questions concerning this filing.

Sincerely,

/s/ Lauren J. Bowen

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CERTIFICATE OF SERVICE

I hereby certify that the parties listed below have been served via electronic mail with a copy of the *Proposed Order* and *List of Issues for Determination by the Commission* filed on behalf of the South Carolina Coastal Conservation League and Southern Alliance for Clean Energy.

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This 12th day of November, 2019.

s/ Lauren Fry
Lauren Fry

STATE OF SOUTH CAROLINA

BEFORE THE PUBLIC SERVICE COMMISSION

DOCKET NO. 2019-185-E
DOCKET NO. 2019-186-E

In the Matter of: South Carolina Energy Freedom Act (H.3659) Proceeding to Establish Duke Energy Carolinas, LLC's Standard Offer, Avoided Cost Methodologies, Form Contract Power Purchase Agreements, Commitment to Sell Forms, and Any Other Terms or Conditions Necessary (Includes Small Power Producers as Defined in 16 United States Code 796, as Amended) - S.C. Code Ann. Section 58-41-20(A),	**PARTIAL PROPOSED ORDER OF THE SOUTHERN ALLIANCE FOR CLEAN ENERGY AND SOUTH CAROLINA COASTAL CONSERVATION LEAGUE**
and	
South Carolina Energy Freedom Act (H.3659) Proceeding to Establish Duke Energy Progress, LLC's Standard Offer, Avoided Cost Methodologies, Form Contract Power Purchase Agreements, Commitment to Sell Forms, and Any Other Terms or Conditions Necessary (Includes Small Power Producers as Defined in 16 United States Code 796, as Amended) - S.C. Code Ann. Section 58-41-20(A)	

I. INTRODUCTION

This matter comes before the Public Service Commission of South Carolina ("Commission") pursuant to the provisions of Section 210 of the Public Utility Regulatory Policies Act of 1978 ("PURPA"), 18 U.S.C. § 824a-3, and the Federal Energy Regulatory Commission ("FERC") regulations implementing those provisions, which delegated to this Commission certain responsibilities for determining each utility's avoided costs with respect to rates for purchase from qualified cogenerators and small power production facilities. These proceedings are also held pursuant to S.C. Code Ann. § 58-41-20(A) of the Energy Freedom Act ("Act 62" or "EFA").

By letter dated August 14, 2019 Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP") (together, "the Companies" or "Duke Energy") filed an application to the Commission for approval of the Companies' standard offer avoided cost methodologies, form contract power purchase agreements, and commitment to sell forms.

The South Carolina Solar Business Alliance, LLC ("SBA"), Johnson Development Associates, Inc. ("JDA"), the Southern Alliance for Clean Energy ("SACE") and South Carolina Coastal Conservation League ("CCL"), Ecoplexus, Inc. ("Ecoplexus"), the South Carolina Energy Users Committee ("SCEUC"), and Walmart, Inc. ("Walmart") intervened. Central Electric Power Cooperative sought to intervene but later withdrew its petition to intervene in the proceeding. The South Carolina Office of Regulatory Staff ("ORS") is automatically a party pursuant to S.C. Code Ann. § 58-4-10(B) (2015).

Pursuant to S.C. Code Ann. § 58-41-20(I), the Commission retained Power Advisory, LLC ("Power Advisory") as its qualified, independent third party consultant.

II. STATUTORY STANDARDS

A. PURPA

Section 210 of PURPA and the regulations promulgated pursuant thereto by FERC establish the responsibilities of FERC and state regulatory authorities to encourage the development of cogeneration and small power production facilities. Section 210 of PURPA requires FERC to prescribe such rules as it determines necessary to encourage cogeneration and small power production, including rules requiring the purchase and sale of electric power by electric utilities to cogeneration and small power production facilities. Under Section 210 of PURPA, cogeneration facilities and small power production facilities that meet certain standards can become "qualifying facilities" ("QFs"), and thus become eligible for the rates and exemptions established in accordance with Section 210 of PURPA. 16 U.S.C. § 824a-3(d).

Each utility is required under Section 210 of PURPA to purchase available electric energy from cogeneration and small power production facilities that obtain QF status. *Id.* § 824a-3(a). For such purchases, electric utilities are required to pay rates that are just and reasonable to the ratepayers of the utility, are in the public interest, and do not discriminate against cogenerators or small power producers. *Id.* § 824a-3(b). FERC regulations require that the rates electric utilities pay to purchase electric energy and capacity from qualifying cogenerators and small power producers reflect the cost that the purchasing utility can avoid as a result of obtaining energy and capacity from these

sources, rather than generating an equivalent amount of energy itself or purchasing the energy or capacity from other suppliers.

With respect to electric utilities subject to state jurisdiction, FERC delegated the implementation of these rules to state regulatory authorities. State commissions may implement these rules by the issuance of regulations, on a case-by-case basis, or by any other means reasonably designated to give effect to FERC's rules. However, in evaluating the evidence before it in this proceeding, the Commission is bound to comply with PURPA's minimum requirements. *E.g.*, 18 C.F.R. § 292.303(a) (requiring utility to purchase "any energy and capacity made available from qualifying facility"); 18 C.F.R. 292.304(e)(2) (utility must pay for "daily and seasonal" capacity value); 16 U.S.C. § 824a-3(b); 18 C.F.R. § 292.304(a)(1) (rates "shall not discriminate" against QFs).

The Commission must also remain mindful of PURPA's overall aims, and the pro-consumer, competitive effects that it enables. *See Kamine/Besicorp Allegany L.P.*, 908 F. Supp. 1180, 1192 (W.D.N.Y. 1995) ("effect of PURPA is to *introduce new energy producers into the marketplace*" and stating that if "traditional utilities were successful in excluding [QFs]," that could "reduce *competition*") (emphasis added); *In re Renewable Energy Certificates*, 389 N.J. Super. 481, 486 (N.J. Super. Ct. App. Div. 2007) ("Congress enacted the Public Utility Regulatory Policies Act of 1978 . . . *to increase competition* in the production of electricity and reliance on renewable energy.") (emphasis added); *State ex rel. Sandel v. New Mexico Public Utility Com'n*, 127 N.M. 272, 275, 980 P.2d 55, 58 (N.M. 1999)) ("*Congress introduced competition* into the generation component of the electric power industry by enacting the Public Utility Regulatory Policies Act of 1978.") (emphasis added). As the U.S. Supreme Court has

recognized, "Section 210 of PURPA was designed to encourage the development of cogeneration and small power production facilities" *American Paper Inst. v. Am. Elec. Power Serv. Corp.*, 461 US 402, 405 (1983). In enacting PURPA, "Congress believed that increased use [of renewable energy] would reduce the demand for traditional fossil fuels" and recognized that electric utilities have traditionally been "*reluctant* to purchase power from, and to sell power to, the nontraditional facilities." *FERC v. Mississippi*, 456 U.S. 742, 750 (1982).

B. SOUTH CAROLINA ENERGY FREEDOM ACT

This proceeding also follows the mandates of the EFA, which the South Carolina Legislature designed to encourage renewable energy generation and independent power production. The EFA requires that at least once every twenty-four months, the Commission approve each electrical utility's standard offer, avoided cost methodologies, form contract power purchase agreements, commitment to sell forms, and any other terms or conditions necessary to implement the EFA. S.C. Code Ann. § 58-41-20(A). The EFA provides that any decision by the Commission:

> shall be just and reasonable to the ratepayers of the electrical utility, in the public interest, consistent with PURPA and the Federal Energy Regulatory Commission's implementing regulations and order, and nondiscriminatory to small power producers; and shall strive to reduce the risk placed on the using and consuming public.

Id. The EFA further requires that in these proceedings, "the commission shall treat small power producers on a fair and equal footing with electrical utility-owned resources" by ensuring that "rates for the purchase of energy and capacity *fully and accurately* reflect

the electrical utility's avoided costs" *Id.* § 58-41-20(B)(1) (emphasis added). The Act directs that power purchase agreements, including terms and conditions, "are commercially reasonable" and consistent with PURPA, and that each electrical utility's avoided cost methodology "fairly accounts" for costs avoided or incurred "including, but not limited to energy, capacity, and ancillary services" for small power producers, including "those utilizing energy storage equipment." *Id.* (B)(2),(3).

The EFA also directs the Commission to "engage, for each utility, a qualified independent third party to submit a report that includes the third party's independently derived conclusions as to that third party's opinion of each utility's calculation of avoided costs for purposes of proceedings conducted pursuant to this section." S.C. Code Ann. § 58-41-20(I). The Commission has retained Power Advisory as its independent third party consultant pursuant to the EFA.

III. STANDARD OF REVIEW

Pursuant to South Carolina law, the Commission has a duty to fully document its findings and base its decisions on reliable, probative, and substantial evidence on the whole record. *Porter v. South Carolina Public Service Comm'n*, 333 S.C. 12, 21, 507 S.E.2d 328, 332 (S.C. 1998). The Commission must make findings which are "sufficiently detailed to enable [a] court to determine whether those findings are supported by the evidence and whether the law has been applied properly to those findings." *Id.* Where material facts are in dispute, the Commission must make "specific, express findings of fact." *Id.*

Because avoided cost payments are ultimately recovered through fuel cost riders, this Commission "shall disallow" any costs that result from "any decision of the utility"

resulting in unreasonable costs, with "due regard" given to "*minimization of the total cost of providing service*" among other factors. S.C. Code Ann. § 58-27-865(f) (emphasis added). Further, where non-utility parties make a showing that raises the specter of imprudence presumptive as to the reasonableness of a utility's proposed rate, the utility bears the burden of production and ultimately of persuasion to further substantiate its position. *See Utility Services of South Carolina, Inc. v. S.C. Office of Reg. Staff*, 708 S.E.2d 755, 392 S.C. 96, 110 (S.C. 2011).

In the present case, the utility contends that avoided cost rates and QF terms it has developed through complex modeling and studies informed by its plans, judgment, and expertise are accurate, just and reasonable, and that any departure from those derived rates would be improper. The non-utility parties, by contrast, have challenged the utility's proposed avoided cost rates for the purchase of energy and capacity because those rates and terms do not put "small power producers on a fair and equal footing with electrical utility-owned resources" and fail to "***fully and accurately*** reflect the electrical utility's avoided costs." *Id.* § 58-41-20(B) (1). The non-utility parties have produced evidence and analysis to support their position that the proposed avoided cost rates, by assuming and incorporating costly measures to "integrate" solar generation, unfairly discriminate against QF's and artificially raise the cost of electrical service rather than the "minimization of the total cost of providing service," S.C. Code § 58-27-865(f).

IV. HEARING

The Commission convened a hearing on this matter on October 21 through 22, 2019 with the Honorable Comer H. Randall, Chairman, presiding. Duke Energy was represented by Heather Shirley Smith, Esquire, Rebecca J. Dulin, Esquire, Frank R.

Ellerbe, III, Esquire, and Len S. Anthony, Esquire. SCEUC was represented by Scott Elliot, Esquire. SBA and JDA were represented by Weston Adams, II, Esquire, and Jeremy C. Hodges, Esquire. SBA and Ecoplexus were represented by Richard L. Whitt, Esquire. JDA was represented by James H. Goldin, Esquire. CCL and SACE were represented by J. Blanding Holman, IV, Esquire, Stinson Woodward Ferguson, Esquire, Lauren Joy Bowen, Esquire, and Maia Danaid Hutt, Esquire. Walmart was represented by Carrie Harris Grundmann, Esquire. Nanette S. Edwards, Esquire, Andrew M. Baterman, Esquire, and Alexander W. Knowles, Esquire, represented ORS. In this Order, Duke Energy, ORS, SCEUC, SBA, JDA, Ecoplexus, SACE, CCL, and Walmart are collectively referred to as the "Parties" or sometimes individually as a "Party."

Through their personal appearances, Duke Energy presented the direct testimony George V. Brown and direct testimony and exhibits of Glen A. Snider. Duke Energy presented the consolidated direct and rebuttal testimonies and exhibits of David B. Johnson, Steven B. Wheeler and Nick Wintermantel.[1] Through their personal appearances, SBA presented the consolidated direct and rebuttal testimony and exhibits of Steven J. Levitas, and JDA presented the consolidated direct and surrebuttal testimony of Rebecca Chilton.[2] Through their personal appearances, SBA presented the direct testimony and exhibits of Edward A. Burgess, the direct testimony of Hamilton Davis, and the consolidated direct and surrebuttal testimony of Jon Downey.[3] Through their personal appearances, SACE and CCL presented the consolidated direct and surrebuttal

[1] Prior to the hearing and without objection from the remaining parties, the Commission granted Duke Energy, ORS, JDA, and SBA permission to utilize panels for the presentation of witnesses. Duke Energy Witnesses Brown and Snider presented in the first panel for the Companies; Witnesses Johnson and Wheeler presented in the second panel.
[2] JDA Witness Chilton and SBA Witness Levitas presented as a panel.
[3] SBA Witnesses Downey, Davis and Witness Burgess presented as a panel.

testimony and exhibits of Brendan Kirby and the direct testimony and exhibits of James F. Wilson. Through their personal appearances, ORS presented the consolidated direct and surrebuttal testimony and exhibits of Brian Horii and the direct testimony of Robert A. Lawyer.[4]

In response to the direct testimony of SBA Witnesses Downey and Davis, and JDA Witness Chilton, Duke Energy presented the rebuttal testimony of Witness Brown. In response to the direct testimony of ORS Witnesses Horii and Lawyer, SBA Witnesses Davis and Burgess, and SACE and CCL Witness Wilson, Duke Energy presented the rebuttal testimony of Witness Snider. In response to ORS Witness Horii, SACE and CCL Witness Kirby, and SBA Witness Burgess, Duke Energy presented the rebuttal testimony of Witness John Samuel Holeman, III.

In response to the rebuttal testimony of Duke Energy Witness Snider, SBA presented the surrebuttal testimony of Witness Burgess. In response to the rebuttal testimony of Duke Energy Witnesses Snider and Brown, SBA presented the surrebuttal testimony of Witness Davis. In response to the rebuttal testimony of Duke Energy Witness Snider, SACE and CCL presented the surrebuttal testimony of Witness Wilson. SCEUC, Ecoplexus, and Walmart did not present witnesses at the hearing.

V. REVIEW OF EVIDENCE AND EVIDENTIARY CONCLUSIONS

The Commission has a duty to fully document its findings and base its decisions on reliable, probative, and substantial evidence on the whole record. *Porter v. South Carolina Public Service Comm'n*, 333 S.C. at 21, 507 S.E.2d at 332. The importance of

[4] ORS Witnesses Horii and Lawyer presented as a panel.

searching review is especially important here, where the evidence shows that the utility and its solar competitors have conflicting imperatives in their approach to avoided cost rates and terms.[5] Accordingly, in this matter the Commission exercises a searching review of the utility's proposed avoided cost rates, with an eye towards furthering the goals of the EFA and PURPA to encourage renewable energy development and independent power production, and in a manner that "fully and accurately" reflects avoided costs while minimizing risk to ratepayers and total costs of service.

After hearing the evidence and testimony of the witnesses, summarized below, the Commission reaches its factual and legal conclusions:

A. SEASONAL CAPACITY ALLOCATION

1. Duke Energy Direct Testimony

Duke Energy Witness Snider testified that DEC and DEP's seasonal allocation for capacity payments to QFs is now heavily weighted to the winter season based on the impact of summer versus winter loss of load risk.[6] Witness Snider testified that a study conducted by Astrapé Consulting, the *Solar Capacity Value Study*, found that 100% of DEP's loss of load risk occurs in the winter and 90% of DEC's loss of load risk occurs in the winter.[7] Based on this study, DEP proposed to pay its entire annual capacity rate in the winter and DEC proposed to pay 90% of its annual capacity in the winter and the remaining 10% in the summer.[8]

[5] Tr. Vol. 1, p. 376, ll. 14-18; Tr. Vol. 1, p. 176, l. 17 – p. 177, l. 9; Tr. Vol. 2, p. 659, l. 12 – p. 663, l. 19.
[6] Tr. Vol. 1, p. 58.19, ll. 4-9.
[7] Tr. Vol. 1, p. 58.19, ll. 9-13.
[8] Tr. Vol. 1, p. 58.19, ll.13-15.

2. SBA Direct Testimony

SBA Witness Burgess testified that Duke Energy's seasonal weighted allocation of capacity value is overly skewed to winter mornings versus summer afternoons. He testified that Duke Energy's proposal will lower overall revenues for solar QFs due to the typical production times of solar facilities.[9] Witness Burgess identified a number of assumptions in Astrapé Consulting's *Solar Capacity Value Study* that biased the distribution of loss of load hours ("LOLH") towards early mornings in winter months rather than afternoons in summer months, when solar production is high.[10] These assumptions included: the underlying load forecasts for DEC and DEP; differences in the availability of demand response in winter and summer months; characterization of neighboring utility load, transmission constraints, and corresponding availability of neighbor support during summer and winter months; and seasonal variation in assumptions for forced outage rates and planned maintenance.[11] Witness Burgess also explained that Duke Energy's proposed capacity value allocation did not match historical load data for DEC and DEP.[12] Witness Burgess proposed an alternative seasonal allocation that more closely reflects the historical pattern.[13]

3. SACE and CCL Direct Testimony

SACE and CCL Witness Wilson testified that the *Solar Capacity Value Study* underlying Duke Energy's seasonal allocation proposal employed the same model and many of the same flawed assumptions used in Duke Energy's 2016 Resource Adequacy

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[9] Tr. Vol. 1, p. 382.46, l. 19 – p. 382.47, l. 5.
[10] Tr. Vol. 1, p. 382.47, l. 13 – p. 382.48, l. 2.
[11] Tr. Vol. 1, p. 382. 48, l. 15 – p. 382. 52, l. 8.
[12] Tr. Vol. 1, p. 382.52, l. 12 – p. 382.53, l. 3.
[13] Tr. Vol. 1, p. 382.54, ll. 11-17.

Studies for DEC and DEP ("2016 RA Studies") prepared by Astrapé Consulting.[14] Witness Wilson explained that his analysis showed that the 2016 RA Studies significantly overstated the risk of very high loads under extreme cold, primarily due to the faulty approach Astrapé Consulting used to extrapolate the relationship between temperature and load at very low temperatures.[15] Witness Wilson further explained that the 2016 RA Studies' demand response and operating reserve assumptions applicable to winter peak conditions additionally overstated winter resource adequacy risk relative to the risk in summer and other periods of the year.[16] Witness Wilson also critiqued the 2016 RA Studies' economic load forecast uncertainty assumptions, which greatly overstated the risk of large and unexpected increases in peak load during winter and summer.[17]

Witness Wilson recommended that the Companies' proposed seasonal capacity allocation be rejected and that a more balanced seasonal weighting be developed and approved.[18] Witness Wilson did not recommend specific seasonal weightings, because doing so would require use of the Companies' modeling tools.[19] Witness Wilson referenced the North Carolina Utilities Commission's recent Integrated Resource Plan Order, which scheduled an oral argument to further consider issues related to Duke Energy's load forecast and reserve margins, including the concerns raised in Witness Wilson's testimony in North Carolina.[20]

At the hearing, Witness Wilson testified that he found SBA Witness Burgess and ORS Witness Horii's alternative proposed seasonal allocation of avoided capacity costs

[14] Tr. Vol. 2, p. 495.3, l. 10 – p. 495.4, l. 3.
[15] Tr. Vol. 2, p. 495.6, ll. 11-14; Hearing Exhibit 14, at pp. 6-13
[16] Tr. Vol. 2, p. 495.6, ll. 15-18; Hearing Exhibit 14, at p. pp. 19-21.
[17] Tr. Vol. 2, p. 495.6, ll. 19-21; Hearing Exhibit 14, at pp. 14-19
[18] Tr. Vol. 2, p. 495.7, ll. 16-19; Hearing Exhibit 14, at p. 4.
[19] Tr. Vol. 2, p. 495.8, ll. 8-11; Hearing Exhibit 14, at p. 4.
[20] Tr. Vol. 2, p. 495.5, ll. 10-18.

to be "more reasonable" and "more moderate" than the Companies' proposed allocations.[21] Witness Wilson testified that resource adequacy studies conducted in other jurisdictions, including PJM, ISO New England, and MISO, involve thorough stakeholder processes which require the utility to revise and improve its assumptions and methodologies in response to stakeholder input.[22] Witness Wilson explained that ideally, the Commission would reject Duke Energy's *Solar Capacity Value Study* as "obviously weak and distorted" and require a stakeholder process with discussion and review of draft versions of a subsequent resource adequacy study.[23]

4. ORS Direct and Surrebuttal Testimony

ORS Witness Horii recommended that Duke Energy correct the proposed allocation of capacity costs to reflect current solar penetration levels rather than projected "Tranche 4" penetration levels.[24] Witness Horii testified that Duke Energy's decision to base relative Loss of Load Expectation ("LOLE") on a significantly higher level of solar penetration than what is currently operating is problematic because the timing of the need for capacity when there is more solar penetration is not the same as the timing of the need for capacity when there is less solar. At higher levels of solar generation, the need for system capacity shifts away from the hours where already installed solar is generating.[25] Witness Horii proposed an alternative seasonal and time of day allocation of capacity costs. For DEC, Witness Horii recommended 40% summer, 48% winter morning, and

[21] Tr. Vol. 2, p. 496, l. 21, p. 496, l. 10; Tr. Vol. 2, p. 501, ll. 14-18.
[22] Tr. Vol. 2, p. 498, l. 23 – p. 499, l. 19.
[23] Tr. Vol. 2, p. 499, l. 20 – p. 500, l. 5.
[24] Tr. Vol. 2, p. 525.14, ll. 8-16.
[25] Tr. Vol. 2, p. 525.14, ll. 17-21.

12% winter evening allocation of capacity factors.[26] For DEP, Witness Horii recommended a 1% summer, 69% winter morning, and 30% winter evening allocation.[27]

5. Duke Energy Rebuttal Testimony

Duke Energy Witness Snider argued that for the purpose of seasonal capacity allocation, it is reasonable to assume the level of solar penetration set for North Carolina Competitive Procurement of Renewable Energy ("CPRE") Tranche 4.[28] Witness Snider explained that since the Tranche 4 level of solar is mandated by existing legislation, N.C. HB 589, and the Companies assume the mandated level of solar penetration will be reached, it is appropriate to factor this future capacity into loss of loss of load risk calculations, even though that capacity does not exist yet.[29] Witness Snider acknowledged that while CPRE Tranche 4 includes 3,500 MW of cumulative solar in DEC and 3,585 MW for DEP, the estimate of existing and fully contracted solar for DEC at present is only 1,400 MW.[30] At the hearing, Duke Energy Witness Brown testified that Duke Energy had not met its CPRE Tranche 1 goals.[31]

Witness Snider critiqued SBA Witness Burgess's proposed seasonal capacity allocation analysis for failing to take into account the impact of must-take solar and including an over-broad range of hours that "have no statistical significance for purposes of determining LOLE or resulting seasonal allocation."[32]

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[26] Tr. Vol. 2, p. 525.17, l. 1.
[27] Tr. Vol. 2, p. 525.18, ll. 5-11. Mr. Horii did not explicitly set forth the winter evening allocation, but the remainder of 100% minus 1% summer allocation and 69% winter morning is 30% winter evening allocation.
[28] Tr. Vol. 2, p. 630.59, l. 6 – p. 630.60, l. 2.
[29] Tr. Vol. 2, p. 630.60, ll. 4-17.
[30] Tr. Vol. 2, p. 630.62, ll. 20-23.
[31] Tr. Vol. 1, p. 89, l. 13 – p. 90, l. 1.
[32] Tr. Vol. 2, p. 630.70, ll. 14-23

Witness Snider noted that SACE and CCL Witness Wilson's critiques of the Companies' capacity value allocation "were largely the same" as comments and testimony filed in the 2018 North Carolina IRP proceeding and Avoided Cost Proceeding.[33] Witness Snider stated that the Companies had worked with the North Carolina Public Staff to resolve Witness Wilson's concerns regarding the 2016 RA Studies and that the North Carolina Public Staff "was satisfied" with the Companies' assumptions regarding the relationship between load and cold weather at extreme temperatures.[34]

6. SBA Surrebuttal Testimony

SBA Witness Burgess agreed with ORS Witness Horii's recommendation that the "Existing plus Transition" level of solar is more appropriate for calculating loss of load risk than the "Tranche 4" level of solar.[35] In response to Duke Witness Snider's critique that his analysis did not "take into account the impact of must-take solar" and "incorrectly included an extremely broad number of hours by using the top 5% of total hours," Witness Burgess revised his analysis to account for must-take solar output and adjust the number of hours.[36] Having made these adjustments, Witness Burgess recommended a seasonal capacity allocation of 58% summer and 42% winter for DEC, and 4% summer and 96% winter for DEP.[37] Witness Burgess also noted the importance of demand response assumptions for calculating seasonal allocation of capacity value, and stated that Duke Energy had refused to perform any revised LOLE analysis

[33] Tr. Vol. 2, p. 630.74, ll. 3-5.
[34] Tr. Vol. 2, p. 630.75, l. 12 – p. 630. 76, l. 3.
[35] Tr. Vol. 2, p. 787.22, ll. 1-7.
[36] Tr. Vol. 2, p. 787.21, ll. 8-17.
[37] Tr. Vol. 2, p. 787.22, l. 18 – p. 787.23, l. 1.

accounting for increased winter demand response.[38] Witness Burgess explained that even a modest increase in winter demand response could have significant effects and was worth further consideration.[39]

7. SACE and CCL Surrebuttal Testimony

SACE and CCL Witness Wilson noted that Witness Snider's rebuttal testimony failed to substantively address the critiques Witness Wilson raised in his direct testimony and report regarding the 2016 RA Studies and *Solar Capacity Value Study*'*s* unreasonable conclusions related to winter resource adequacy risk.[40] Witness Wilson further noted that Duke Energy and North Carolina Public Staff's Joint Report referenced by Witness Snider failed to address Witness Wilson's analysis regarding the relationship between extreme cold and load.[41] Witness Wilson further explained that the limited sensitivity analysis conducted by the North Carolina Public Staff did not correct the 2016 RA Studies' flawed assumptions regarding the relationship between extreme cold and load. Witness Wilson also elaborated on his report's discussion of load forecast uncertainty, explaining that the 2016 RA Studies inappropriately used multiple years of load forecast uncertainty and substantially misrepresented the data underlying the load forecast.[42] Witness Wilson noted that Duke Witness Snider did not dispute these points, and merely asserted, absent explanation or analysis, that adopting Witness Wilson's recommendations "would not have an impact on the allocation of LOLE or the

[38] Tr. Vol. 2, p. 787.23, ll. 4-14.
[39] Tr. Vol. 2, p. 787.24, ll. 4-6.
[40] Tr. Vol. 2, p. 828.5, ll. 5-9.
[41] Tr. Vol. 2, p. 828.6, ll. 1-6.
[42] Tr. Vol. 2, p. 282.7, l. 14 – p. 282.8, l. 6.

Companies' rate design."[43] Witness Wilson disagreed with this assertion, stating that "a different approach to the load forecast uncertainty could well have a substantial impact on LOLE allocation, due to the substantial differences between the summer and winter load shapes to which the load forecast uncertainty multipliers are applied."[44]

At the hearing, Witness Wilson testified that defaulting to the most recently approved seasonal allocations which were not tainted by the issues he identified in the 2016 RA Studies and *Solar Capacity Value Study*, and represented a more balanced allocation between the winter and summer would be preferable to approving Duke Energy's currently proposed seasonal capacity allocations.[45] Witness Wilson also expressed support for the Companies being required to make compliance filings rectifying the problematic assumptions in the 2016 RA Studies and *Solar Capacity Value Study* and adjusting capacity rates.[46]

8. SACE and CCL Late-Filed Exhibit

At the hearing, following SACE and CCL Witness Wilson's direct testimony, Commissioner Ervin asked Witness Wilson to provide a late-filed exhibit making recommendations for the development and review of resource adequacy studies in future proceedings.[47] Following the hearing, SACE and CCL filed Late Filed Exhibit 15, prepared by Witness Wilson, which explained the value of transparent and detailed resource adequacy studies where sensitivity analysis and stakeholder input helps parties

[43] Tr. Vol. 2, p. 282.8, ll. 8-11.
[44] Tr. Vol. 2, p. 282.8, ll. 14-17.
[45] Tr. Vol. 2, p. 519, ll. 1-9.
[46] Tr. Vol. 2, p. 519, ll. 10-17.
[47] Tr. Vol. 2, p. 510, l. 24 – p. 511, l. 8.

gain confidence that assumptions and results are realistic and technically sound.[48] SACE and CCL stressed the importance of regular updates to resource adequacy studies, with opportunities for stakeholder feedback and input similar to PJM's resource adequacy study and review process.[49] Specifically, SACE and CCL showed that PJM uses a 14-month timeline which includes iterative stakeholder review and comment. SACE and CCL contrasted this robust review process with Duke Energy's current practice of preparing resource adequacy studies without stakeholder input.[50] SACE and CCL also detailed Duke Energy's repeated refusal to provide standard model reports or perform additional simulations or sensitivity analyses in response to stakeholder requests for additional transparency.[51]

Finally, SACE and CCL reiterated several recommendations for future IRPs and resources adequacy studies consistent with Witness Wilson's testimony and report. SACE and CCL recommended that the Companies be required to: (1) study the relationship between extreme cold and load; (2) study the drivers of sharp winter load spikes under extreme conditions and develop programs for shaving these rate and brief spikes; (3) research the potential for load forecast error due to economic and demographic forecast errors, and the realistic extent to which this could lead to less capacity than planned in a delivery year and to inform future resource adequacy studies; (4) provide more scenario and sensitivity analysis of its studies used to determine reserve margins and seasonal, monthly, and hourly capacity values; and (5) provide more detailed information about future resource adequacy and related studies, including all model

[48] SACE and CCL, Late Filed Exhibit No. 15, p. 1.
[49] *Id.* at p. 3.
[50] *Id.* at p. 4.
[51] *Id.* at p. 5.

reports and a more comprehensive set of sensitivity analyses. SACE and CCL also recommended that a process be established for stakeholders to review and provide input on proposed assumptions for future resource adequacy studies before those assumptions are finalized and that stakeholders be afforded opportunities to request details of model inputs and output, sensitivity analyses, and other model validation information before studies are finalized.[52]

9. Independent Consultant Report

The Commission's independent third party consultant, Power Advisory, prepared a report reviewing various aspects of Duke Energy's proposals. Power Advisory agreed with ORS Witness Horii that "avoided costs should be calculated based on current solar levels, rather than expected future solar levels even when these are based on a legislated policy commitment."[53] Power Advisory concluded that "the avoided capacity cost of solar added to the system today should be based on the amount of solar on the system today."[54] Therefore, Power Advisory found that the capacity weightings proposed by Witness Horii in his surrebuttal testimony are reasonable and recommended that the Companies be directed to update their avoided capacity cost rates to reflect these weightings.[55]

Power Advisory concluded that SACE and CCL Witness Wilson presented "compelling" evidence that Duke Energy's modeling of the impact of extreme

[52] *Id.* at pp. 7-8.
[53] Power Advisory LLC, Docket Nos. 2019-185-E and 2019-186-E, Independent Third Party Consultant Final Report Pursuant to South Carolina Act 62 at p. 26.
[54] *Id.*
[55] *Id.* at p. 27.

temperatures on load is "problematic."[56] Power Advisory also found that while an impact on required reserve margins of 0.3% may not be a material concern, this does not mean, as Duke Energy suggests, that impact on the weighting of capacity value between summer and winter seasons is also immaterial.[57]

Power Advisory found that the LOLE studies used by Duke are an appropriate methodology to assess the seasonal contribution of capacity, and that the seasonal estimate put forth by SBA Witness Burgess, which used a more simple methodology, should not be adopted, but represented a reasonable check on the LOLE modeling.[58]

10. Commission's Conclusions Regarding Seasonal Allocation of Capacity Costs

The Commission concludes that the Companies' proposal to allocate seasonal capacity 100% winter, 0% summer in DEP and 90% winter, 10% summer in DEC is unreasonable for the following reasons.

First, the Commission agrees with ORS Witness Horii that the avoided capacity cost of solar added to the system today should be based on the amount of solar on the system today, and not on expected future solar levels, even when that future level is derived from legislative policy commitments. Duke Energy's proposal to base its seasonal capacity allocation on the future CPRE "Tranche 4" level of solar penetration is speculative and unreasonable because it ties the rates paid to existing solar QFs to a procurement goal which may not be met. Duke Energy's proposal is especially concerning given that Duke Energy Witness Brown acknowledged the Companies did not

[56] *Id.*
[57] *Id.*
[58] *Id.*

meet CPRE Tranche 1 goals for procurement. The Commission finds persuasive Witness Horii's testimony, and Power Advisory's agreement that "the avoided capacity cost of solar added to the system today should be based on the amount of solar on the system today."

Second, the Commission finds compelling the testimony of SACE and CCL Witness Wilson, whose testimony and expert report demonstrated that the Companies' resource adequacy modeling failed to accurately predict system load at cold temperatures, and as a result undervalued QFs' capacity contributions. Witness Wilson persuasively demonstrated that the Companies likely overestimated winter resource adequacy risk relative to summer resource adequacy risk due to a faulty approach to extrapolating the impact of extreme cold on load, and unreasonable demand response and operating reserve assumptions during winter peak conditions. Therefore, the Commission finds that the 2016 Resource Adequacy Reports and *Solar Capacity Value Study* are not reliable. The Commission will require the Companies to initiate a stakeholder process for the purpose of more accurately quantifying these variables and developing more reasonable assumptions for the Companies' future resource adequacy studies.

The Commission also finds persuasive Witness Wilson's testimony and late-filed exhibit regarding the necessity of adopting a collaborative and transparent stakeholder process for developing future resource adequacy studies. The Commission will require the Companies to develop and propose a process, subject to stakeholder comments and Commission review, which allows stakeholders to review and provide input on proposed assumptions for future resource adequacy studies before those assumptions are finalized. The Commission will require that this process afford stakeholders an opportunity to

request details of model inputs and output, sensitivity analyses, and other model validation information before studies are finalized; and provide for up-front stakeholder review and feedback of future resource adequacy studies.

The Commission finds that the Companies' proposed seasonal allocation of capacity costs is not adequately supported by evidence. In the absence of a seasonal capacity allocation supported by a reliable resource adequacy study, the Commission will direct the Companies to recalculate their proposed avoided capacity rates based on the seasonal capacity allocations previously approved in Docket No. 1995-1192-E, of 60%/40% weighting for summer and non-summer months for DEC Option B and DEP Options A and B, and 80%/20% weighting for DEC Option A.

VI. SOLAR INTEGRATION SERVICES CHARGE

1. Duke Energy Direct Testimony

Duke Energy Witness Snider testified that the EFA required the Companies to take into account costs avoided or incurred by the utilities, including ancillary services provided by or consumed by small power producers. Witness Snider testified that the Companies' proposed solar integration services charge ("SISC") was intended to account for measurable costs of integrating intermittent solar QF power.[59] Witness Snider explained that the energy output from solar resources is variable and increases uncertainty and volatility on the system, which requires the Companies to carry additional operating reserves in order to balance and regulate the system on an hourly and

[59] Tr. Vol. 1, p. 58.30, ll. 8-16.

sub-hourly basis.[60] Witness Snider further explained that Duke Energy commissioned Astrapé Consulting to analyze the impacts of integrating solar at varying penetration levels and to quantify the cost of utilizing the DEC and DEP fleets to provide the additional operating reserves needed to reliably integrate the various intermittent solar generation.[61] The *Ancillary Service Study* prepared by Astrapé Consulting calculated a SISC of $1.10/MWh for DEC and $2.39/MWh for DEP.[62] However, Witness Snider explained, this dollar amount would be variable, updated in every biennial avoided cost proceeding.[63] Witness Snider also explained that some solar QFs would be able to mitigate or avoid the SISC by deploying energy storage to mitigate the Companies' need to carry additional operating reserves.[64]

Duke Witness Wintermantel introduced Astrapé Consulting's *Ancillary Service Study*, which simulated total production costs and reliability metrics of the system for several levels of solar penetration.[65] The *Ancillary Service Study* estimated the amount of additional ancillary services required in order to maintain reliability on the system at each level of solar penetration, and the costs of those additional ancillary services.[66] Witness Wintermantel explained that the *Ancillary Service Study* used the $LOLE_{FLEX}$ metric to assess system flexibility and reliability. Specifically, "any time that load plus minimum operating reserves cannot be met by the generation fleet on a five-minute time step, then the model records a loss of load event."[67] The *Study* was targeted to have a $LOLE_{FLEX}$ of

[60] Tr. Vol. 1, p. 58.32, ll. 1-10.
[61] Tr. Vol. 1, p. 58.34, ll. 5-12.
[62] Tr. Vol. 1, p. 58.36, ll. 14-16.
[63] Tr. Vol. 1, p. 58.36, ll. 18-21.
[64] Tr. Vol. 1, p. 58.38, ll. 15-21.
[65] Tr. Vol. 1, p. 302.9, ll. 8-18.
[66] Tr. Vol. 1, p. 302.9, ll. 15-18.
[67] Tr. Vol. 1, p. 302.14, ll. 9-20.

0.1 events per year—or one event in ten years.[68] If, as solar penetration increased, the $LOLE_{FLEX}$ exceeded 0.1 events per year, the *Study* determined that additional load following reserves were required.[69] Witness Wintermantel acknowledged that the $LOLE_{FLEX}$ metric used by the *Study* was not a North American Electric Reliability ("NERC") standard governing the Companies' actual operations, but testified that "$LOLE_{FLEX}$ does serve as a reasonably correlated proxy to the NERC Balancing Standards."[70] Witness Wintermantel explained that at high solar penetrations the *Study* "indicated an exponentially increasing cost of integrating incremental solar."[71] Witness Wintermantel stated that at the level of solar penetration forecasted to be installed by 2020, the incremental ancillary service cost impact would be $3.22/MWh for DEC and $6.70/MWh for DEP.[72]

Duke Energy Witness Wheeler testified that the Companies were proposing to apply the SISC to all solar QFs that either establish a Legally Enforceable Obligation ("LEO") or otherwise extend a Power Purchase Agreement ("PPA") on or after November 30, 2018.[73]

Witness Wheeler also stated that the incremental ancillary service cost impact for the year 2020—$3.22/MWh for DEC and $6.70/MWh for DEP—would be used to set a cap on the SISC, which would prohibit the SISC from exceeding the cap during a contract term.[74] Witness Wheeler also testified that pursuant to the Companies' proposal, if a solar generator could demonstrate its capability of operating in a manner that

[68] Tr. Vol. 1, p. 302. 15, ll. 22-23.
[69] Tr. Vol. 1, p. 302.15, l. 23 – p. 302.16, l. 4.
[70] Tr. Vol. 1, p. 302.16, ll. 7-22.
[71] Tr. Vol. 1, p. 302.19, ll. 6-8.
[72] Tr. Vol. 1, p. 302.25, ll. 18-22.
[73] Tr. Vol. 1, p. 360.30, ll. 15-17.
[74] Tr. Vol. 1, p. 260.29, l. 20 – p. 260.30, l. 2.

significantly reduces or eliminates the need for additional ancillary service requirements, a PPA could be executed that would eliminate the applicability the SISC.[75]

2. SBA Direct Testimony

SBA Witness Burgess testified that Duke Energy's proposed SISC was inappropriate for five primary reasons. First, Witness Burgess explained that the SISC was premature since the true costs of solar integration had not yet been quantified through an independent analysis as contemplated by the EFA, S.C. Code Ann. § 58-37-60(A).[76] Second, Witness Burgess explained that the *Ancillary Service Study* conducted by Astrapé Consulting had numerous analytical flaws, including an overly stringent reliability metric; modeling of DEC and DEP as islands; overstated volatility and failure to account for geographic diversity benefits; potential double counting; and unit commitment and dispatch procedures that may have deviate from Duke Energy's actual practices.[77] Third, Witness Burgess explained that there is very little evidence in any jurisdiction that the exponentially increasing integration costs calculated by the *Ancillary Service Study* will materialize in the near future due to incremental solar deployment.[78] Fourth, Witness Burgess testified that Duke Energy's proposal only considered the integration costs imposed by solar QFs and failed to consider integration services that could be provided by solar QFs.[79] Fifth, Witness Burgess explained that the SISC as proposed was linked to a hypothetical model rather than real-world costs and therefore introduced unnecessary uncertainty that would stymie solar QF development in South

[75] Tr. Vol. 1, p. 260.31, ll. 16-20.
[76] Tr. Vol. 1, p. 382.70, ll. 13-15; p. 382.71, l. 13 – p. 382.72,l. 25.
[77] Tr. Vol. 1, p. 382. 73, l. 7 – p. 382.81, l. 8.
[78] Tr. Vol. 1, p. 382.81, l. 10 – p. 382.88, l. 16.
[79] Tr. Vol. 1, p. 382.86, l. 1 – p. 382.88, l. 6.

Carolina. Specifically, Witness Burgess critiqued the proposed cap for the SISC as being unreasonably high and explained that QFs would have to assume they would be required to pay the full capped rate in order to obtain financing.[80]

SBA Witness Levitas also provided testimony on the proposed SISC. Witness Levitas testified that Duke Energy's proposal that the SISC be variable in nature results in the contracts being offered to QFs not being fixed-price in nature. As a result of the lack of long-term revenue uncertainty in a variable contract, Witness Levitas opined that the SISC as proposed would "very likely preclude any further QF development in South Carolina."[81]

3. SACE and CCL Direct Testimony

SACE and CCL Witness Kirby provided testimony regarding Duke Energy's SISC and Astrapé Consulting's *Ancillary Service Study*. Witness Kirby explained that the methodology of the *Ancillary Service Study* is fundamentally flawed and insufficient to support Duke Energy's proposed SISC.[82] Specifically, Witness Kirby testified that the *Study*: (1) relied on an overly stringent, unrealistic $LOLE_{FLEX}$ 0.1 metric that did not reflect Duke Energy's actual operations, including the benefits of being part of the Eastern Interconnections; (2) improperly scaled solar plant intra-hour variability data in a way that failed to accurately reflect the geographic diversity benefits of distributed solar; (3) failed to identify specific operation conditions under which reliability was challenged and instead increased operating reserve requirements during all hours, even overnight when solar generation could not possibly be adding variability or uncertainty to the

[80] Tr. Vol. 1, p. 382.90, ll. 3-18.
[81] Tr. Vol. 1, p. 322.32, ll. 1-17.
[82] Tr. Vol. 2, p. 460.3, ll. 10-13.

system; and (4) required all solar integration reserves to come from additional online spinning generation rather than lower cost non-spinning, off-line, fast start generation and demand response.[83]

Witness Kirby also explained that the *Ancillary Service Study's* calculation of reserve requirements was not consistent with historic data.[84] In particular, Witness Kirby demonstrated that while solar generation in DEC and DEP doubled between 2015 and 2018, operating reserves did not increase significantly during this time period.[85] Witness Kirby also discussed trends in solar integration costs from other jurisdictions, and pointed to several utilities that have successfully integrated large amounts of solar without increasing operating reserve amounts and costs.[86]

Witness Kirby recommended that the SISC be rejected and the *Ancillary Service Study* methodology be modified to account for the methodological errors he identified in his testimony.[87] Witness Kirby also recommended a Technical Review Committee comprised of independent variable renewable generation integration experts to help design and guide any future studies supporting proposed SISCs.[88] Witness Kirby recommended that if the Commission were to determine that a SISC should be implemented, the SISC should be reduced substantially to account for the *Ancillary Service Study's* methodological errors. Specifically, Witness Kirby suggested that a

[83] Tr. Vol. 2, p. 460.5, l. 20 – p. 460.6, l. 22; p. 460.17, l. 12 – p. 460.33, l. 15.
[84] Tr. Vol. 2, p. 460.7, l. 21– p. 460.12, l. 9.
[85] Tr. Vol. 2, p. 460.12, ll. 4-7.
[86] Tr. Vol. 2, p. 460.13, l. 5 – p. 460.17, l. 5.
[87] Tr. Vol. 2, p. 460.32, l. 19 – p. 460.35, l. 21.
[88] Tr. Vol. 2, p. 460.35, ll. 16-18.

$0.05/MWh SISC in DEC and a $0.11/MWh SISC in DEP would more accurately reflect actual integration costs.[89]

4. ORS Direct Testimony

ORS Witness Horii testified that the Companies' general approach to estimating solar integration costs was acceptable,[90] but found that the results of the *Ancillary Service Study* indicate higher solar integration costs than would be required if the Companies were seeking to minimize costs. Specifically, Witness Horii suggested that integration costs could potentially be reduced by: (1) dynamically linking additional operating reserve requirements to solar output levels and varying risk of solar output reductions; (2) employing improved solar output forecast methods to reduce the forecast error between expected and actual solar output; and (3) employing pre-curtailment of solar to reduce the cost to address solar over-forecast error.[91] Witness Horii recommended that the SISC be adopted as the upper limit for contracts signed under the Standard Offers proposed by the Companies, but that the Companies should be required to conduct additional integration studies, and if lower incremental integration services charges were to be adopted for future offers, the integration services charges for this vintage of Standard Offer contracts should be updated to reflect these lower values.[92]

5. Duke Energy's Rebuttal Testimony

In his rebuttal testimony, Duke Witness Snider stated that in proposing the SISC, the Companies made an intentional effort to balance customers' interests and the interests

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[89] Tr. Vol. 2, p. 460.35, l. 22 – p. 460.36, l. 8.
[90] Tr. Vol. 2, p. 525.19, ll. 12-16.
[91] Tr. Vol. 2, p. 525.20, ll. 3-9.
[92] Tr. Vol. 2, p. 525.23, ll. 10-19.

of QF development community.[93] Witness Snider also testified that ORS Witnesses Horii and Lawyer supported the SISC as proposed.[94] Witness Snider stated that while the Companies are not opposed to holding a technical workshop prior to updating the SISC in future avoided cost proceedings, that a workshop facilitated by ORS and involving independent third-party consultants would be most preferable.[95] Witness Snider disagreed with SBA Witness Burgess's testimony that the integration study contemplated by the EFA could more accurately and completely quantify solar integration costs; Witness Snider testified that the study contemplated by the EFA was intended to "identify future potential grid assets that help to enable increasing levels of intermittent generation in a safe and reliable manner" and not to "quantify the specific costs borne by consumers" due to increases in ancillary service requirements.[96] Witness Snider did not provide any support for this interpretation.

Duke Energy Witness Wintermantel's rebuttal testimony stated that all parties to the proceeding agreed that increased solar on the DEC and DEP systems causes increased net load volatility, resulting in increased system costs.[97] Witness Wintermantel argued that the North Carolina Public Staff's review of the *Ancillary Service Study* was sufficient peer review and that no further review was necessary.[98] Witness Wintermantel further asserted that the $LOLE_{FLEX}$ metric used in the *Ancillary Service Study* was not overly stringent or unreasonable and did not attempt to measure NERC violations, instead he

[93] Tr. Vol. 2, p. 630.82, l. 17 – p. 630.85, l. 10.
[94] Tr. Vol. 2, p. 630.85, ll. 14-22.
[95] Tr. Vol. 2, p. 630.86, ll. 6-16.
[96] Tr. Vol. 2, p. 630.87, ll. 6-24.
[97] Tr. Vol. 2, p. 304.5, l. 9 – p. 304.6, l. 9.
[98] Tr. Vol. 2, p. 304.7, l. 15 – p. 304.9, l. 7.

stated that the NERC standards and $LOLE_{FLEX}$ are correlated.[99] Witness Wintermantel also represented that contrary to SBA Witness Burgess and SACE and CCL Witness Kirby's testimony, operating reserves in other jurisdictions, specifically California, have increased as intermittent renewable resources increased.[100] Witness Wintermantel also contested Witness Kirby's conclusion that the uniform distribution of reserve requirements 8,760 hours per year inflated ancillary service costs, arguing that the *Study* did not manually increase operating reserves in 8,760 hours because many hours had already met the enhanced reserve targets. Witness Wintermantel acknowledged that "commitment decisions for on-peak would also affect reserves in off-peak hours" but went on to claim that the reserves target during off-peak hours "is expected to be immaterial to the incremental commitment decisions" and therefore would not inflate operating reserve requirements. [101]

In his rebuttal testimony Duke Energy Witness Holeman discussed the operational challenges system operators in DEC and DEP experience as QF solar penetration increases in the Companies' balancing areas.[102] Witness Holeman explained how DEC and DEP operate to NERC reliability standards.[103] Witness Holeman testified that a balancing area with variable and intermittent energy from solar QFs is at an increased risk of violating NERC standards, and how system operators manage this risk.[104] Witness Holeman argued that reducing solar integration costs is more difficult than ORS

[99] Tr. Vol. 2, p. 304.14, ll. 6-13.
[100] Tr. Vol. 2, p. 304. 22, l. 19 – p. 304.23, l. 20.
[101] Tr. Vol. 2, p. 304.32, l. 17 – p. 304.33, l. 7.
[102] Tr. Vol. 2, p. 758.4, l. 20 – p. 758.5, l.2
[103] Tr. Vol. 2, p. 758.27, l. 19 – p. 758.29, l. 4.
[104] Tr. Vl. 2, p. 758.29, l. 8 – p. 758.33, l. 13.

Witness Horii testified.[105] Witness Holeman also critiqued SBA Witness Burgess's testimony that QF solar could be used as a dispatchable resource to provide regulation and load following services.[106] Witness Holeman responded to SACE and CCL Witness Kirby's direct testimony by stating that using existing off-line contingency reserves to lower the cost of operating reserves necessary to integrate solar at increasingly high penetrations was unreasonable.[107]

6. SBA Surrebuttal Testimony

In his surrebuttal testimony, SBA Witness Burgess contested Duke Energy Witness Snider's assertion that the proposed cap on the SISC represented a balanced solution for QF and customer interests. Witness Burgess explained that the SISC represented a less than 1% savings for customers and was based on costs that may not even materialize, and that the proposed cap was so high as to render future QF projects unfinanceable.[108] In response to Witness Snider's testimony that PURPA does not envision the payment of QFs for ancillary services, Witness Burgess pointed out that the EFA specifically requires the utility to calculate the value of "ancillary services provided by or consumed by small power producers." S.C. Code Add. § 58-41-20(B)(3).[109]

7. SACE and CCL Surrebuttal Testimony

In his surrebuttal testimony, SACE and CCL Witness Kirby contested Witness Wintermantel's claim that all parties agree that "additions of intermittent solar increases net load volatility" and that "as a result of the increase in net load volatility on the

[105] Tr. Vol. 2, p. 758.5, ll. 13-16.
[106] Tr. Vol. 2, p. 758.46, l. 20 – p. 758.52, l. 1.
[107] Tr. Vol. 2, p. 758.5, l. 17 – p. 758.6, l. 2; Tr. Vol. 2, p. 758.43, l. 9 – p. 758.45, l. 17.
[108] Tr. Vol. 2, p. 787.24, ll. 12-16.
[109] Tr. Vol. 2, p. 787.25 ll. 8-13.

Companies' systems, the systems operate differently and in a way that results in increased system costs." Witness Kirby pointed out that while, as a matter of theory, the addition of intermittent solar generation may increase net load volatility, Duke Energy had failed to provide evidence that increased solar generation on the DEC and DEP systems actually results in increased system costs.[110] In fact, Witness Kirby explained, Duke Energy's historical data demonstrates that the Companies' actual operating reserves have not significantly increased as solar capacity has increased.[111] Witness Kirby argued that the *Ancillary Service Study's* predictions directly contradicted observed historical data indicating that there is no significant cost associated with increased solar penetration, and therefore the imposition of the proposed SISC based on the *Study* would be inappropriate.[112] Witness Kirby further explained that DEC and DEP's historical Area Control Error ("ACE"), which measures ability to balance load, had not deteriorated since 2014; therefore Duke Energy's claims that increased QF solar led to the Companies experiencing balancing problems were unfounded.[113] Witness Kirby also stated that even if increasing solar generation triggered changes in DEC and DEP's operating practices, the Companies were not entitled to pass costs associated with these changes onto solar QFs because different generation resources generally require different operating practices, and the Companies do not penalize most generators for this fact.[114] For example, Witness Kirby explained, coal units cannot be cycled off overnight and have relatively high minimum loads, resulting in higher reserve availability but less efficient

[110] Tr. Vol. 2, p. 462.2 ll. 15-18.
[111] Tr. Vol. 2, p. 462.2, l. 18 – p. 462.3, l. 2.
[112] Tr. Vol. 2, p. 462.3, l. 6-14.
[113] Tr. Vol. 2, p. 462.4, l. 4 – p. 462.6, l. 3.
[114] Tr. Vol. 2, p. 462.6, ll. 4-8.

overnight operations than is possible for more flexible generators, but Duke Energy has never attempted to impose a fee upon coal units for having lower efficiency.[115]

Witness Kirby also responded to Duke Energy Witness Wintermantel's claim that integration of renewables increased ancillary service costs in CAISO. Witness Kirby explained that Witness Wintermantel had cherry picked language from the 2016 CAISO Annual Market Performance Report stating that ancillary service costs increased between 2015-2016, but ignored language in the same report stating that CAISO found it had not, in fact, needed these additional reserves in order to integrate solar, and decreased reserves back to their original level after four months.[116] Witness Kirby also explained that the increase in contingency reserves seen in the CAISO 2017 Report occured because the largest credible contingency was increased to include loss of both halves of the Pacific DC Intertie, a much larger contingency than had been previously planned for.[117] Therefore, Witness Kirby concluded, it is not true that renewables have led to increasing operating reserve requirements in California.

Witness Kirby also responded to Witness Wintermantel's claim that because the *Ancillary Service Study* did not manually increase operating reserves in all hours of the year, operating reserve requirements were not overstated. Witness Kirby pointed out the conflict between Witness Wintermantel's claim that hours when solar QFs are generating represent the only times when increasing target reserves would influence commitment decisions and the testimony of Duke Energy Witness Snider that Duke Energy's capacity

[115] Tr. Vol. 2, p. 462.2, l. 8 – p. 462.7, l. 6.
[116] Tr. Vol. 2, p. 462.8, l. 4 – p. 462.9, l. 9.
[117] Tr. Vol. 2, p. 462.11, ll. 3-11.

needs occur predominantly during hours when solar QFs cannot generate.[118] If Witness Snider were correct, Witness Kirby argued, then the *Ancillary Service Study's* heightened reserve requirement 8,760 hours per year, including during the highest stress non-daylight hours, would increase costs significantly. The proposed SISC would then pass on those costs to solar QFs, even though a significant portion of the costs would be generated by increased reserve requirements during hours when solar QFs are not generating and could not possibly be imposing costs on the system.[119]

Finally, Witness Kirby responded to Duke Energy Witness Holeman's statement that allowing existing off-line contingency reserves to respond to solar volatility would impact system reliability. Witness Kirby explained that Witness Holeman misunderstood his testimony. Witness Kirby had not suggested that *existing* contingency reserves be used to respond to respond to solar volatility; rather, he testified that the *Ancillary Service Study* should calculate the cost of solar integration based on the cost of adding non-spinning reserves instead of adding expensive spinning reserves.[120]

8. ORS Surrebuttal Testimony

In his surrebuttal testimony, ORS Witness Horii testified that he had concerns about the *Ancillary Service Study's* estimation of solar integration charges.[121] Specifically, Witness Horii stated that given the *Study's* exponential increase of the estimated charges at higher levels of solar penetration, he would not recommend that the results of the study be adopted for higher solar penetrations and restated that the SISC as

[118] Tr. Vol. 2, p. 462.15, ll. 3-17.
[119] Tr. Vol. 2, p. 462.15, l. 11- 462.16, l. 2.
[120] Tr. Vol. 2, p. 462.17, ll. 6-15.
[121] Tr. Vol. 2, p. 528.15, ll. 7-9.

calculated by the companies currently should be the ceiling, not the floor, for the charge.[122]

9. SISC Stipulation

On October 21, 2019, Duke Energy, SBA, JDA, and SACE and CCL entered into a partial settlement agreement ("the Agreement") regarding Duke Energy's proposed SISC. ORS has represented that it does not oppose the Agreement.[123] The Agreement provides that the SISC of $1.10/MWh for DEC and $2.39/MWh for DEP were reasonable for purposes of this proceeding. The Agreement further provides that these charges will not be subject to adjustment during the term of a QF's PPA. The Agreement also provides that the SISC could not be imposed upon QFs that are "controlled solar generators" meaning, generally, any QF that demonstrates that its facility is capable of operating, and contractually agrees to operate, in a manner that materially reduces or eliminates the need for additional ancillary service requirements incurred by the utility. The Agreement requires that Duke Energy file with the Commission by November 18, 2019, for review and comment, proposed guidelines for QFs to become "controlled solar generators" and thereby avoid the SISC.

The Agreement also requires that Duke Energy submit the study methodology and inputs of the *Ancillary Service Study* to an independent technical review and include the results of that review and any revisions in its initial filing. The independent review of the study methodology shall, to the maximum extent practicable, take into consideration the South Carolina Integration Study called for by S.C. Code Ann. § 58-37-60, and this

[122] Tr. Vol. 2, p. 528.15, ll. 10-14.
[123] Tr. Vol. 1, p. 179, ll. 7-15.

process would be subject to Commission oversight and comment from interested stakeholders.

Finally, the Agreement provides that to the extent that the Companies propose to impose the SISC for any other programs or contexts in South Carolina, the Commission will separately consider the appropriateness and applicability of the SISC in those proceedings.

Duke Energy Witnesses Snider, Wheeler, and Wintermantel, SACE and CCL Witness Kirby, and SBA Witness Burgess all testified at the hearing that the Agreement represents a fair, reasonable, and full resolution of all issues in this proceeding regarding the SISC, and their testimony should not be construed as advocating for any position that is contrary to the terms of the stipulation.[124]

10. Independent Consultant Report

The Commission's Independent Consultant, Power Advisory, LLC, accepted the Agreement as "a reasonable accommodation among the parties regarding the contentious issues surrounding variable resource integration charges."[125]

[124] Tr. Vol. 1, p. 299, ll. 7-13; Tr. Vol. 1, p. 56, l. 19 – p. 57, l. 1; Tr. Vol. 1, p. 258, ll. 14-21; Tr. Vol 1, p. 378, ll. 7-14; Tr. Vol. 2, p. 458, ll. 16-24.
[125] Power Advisory, LLC, Docket 2019-185-E and 2019-186-E Independent Consultant Final Report at p. 30.

11. Commission's Conclusions Regarding the Solar Integration Services Charge

These proceedings represent the first instance in which the Commission has considered the adoption of an integration charge that would apply exclusively to solar QFs. As demonstrated by the testimony of the Parties to this proceeding, the methodology in the *Ancillary Service Study* used to quantify DEC and DEP's increased ancillary service costs and to calculate the Companies' proposed SISC presents novel and complex issues that warrant further consideration.

The Commission considers the October 21, 2019 Partial Settlement Agreement between Duke Energy, SBA, JDA, and SACE and CCL to be a reasonable outcome pending further study, and therefore accepts the Partial Settlement Agreement in its entirety.

VII. FINDINGS OF FACT

1. Duke Energy's proposed capacity rate design and seasonal allocation for QF payments relies on Astrapé Consulting's 2016 Resource Adequacy Studies and *Solar Capacity Value Study*. Parties to this proceeding have raised numerous concerns about flawed assumptions in these studies that result in inaccurate and improper capacity rates and rate design.

2. In particular, the *Solar Capacity Value Study* relied on the 2016 Resource Adequacy Studies' load modeling, which overstates the risk of very high loads under extreme cold; assumes demand response will continue to be summer-focused despite identifying more resource adequacy risk in the winter; and overstates risk of loss of load year-round due to unrealistic economic load forecast uncertainty assumptions.

3. There are multiple unresolved issues relating to Duke Energy's reserve margin calculations and load forecast methodology that have not been resolved in this proceeding. Therefore, the Commission lacks sufficient evidentiary support to determine that Duke Energy's proposed capacity rates and rate design are reasonable and appropriate.

4. For the purpose of determining seasonal allocation of capacity payments, it is not reasonable for Duke Energy to assume demand response will continue to be summer-focused despite identifying more resource-adequacy risk in winter.

5. For the purpose of determining seasonal allocation of capacity payments it is not reasonable for Duke Energy to assume a linear and unbounded relationship between load and temperature at extremely cold temperatures.

6. For the purpose of determining seasonal allocation of capacity payments it is not reasonable for Duke Energy to use multiple years of economic load forecast uncertainty assumptions.

7. The avoided capacity cost of solar added to the system today should be based on the amount of solar on the system today, and not on expected future solar levels.

8. The methodology in the *Ancillary Service Study* used to quantify DEC and DEP's increased ancillary service costs and to calculate each utility's SISC presents novel and complex issues that warrant further consideration.

9. A variable SISC would impose significant uncertainty upon solar QFs and compromise their ability to obtain financing.

10. The SISC proposed by Duke Energy, as agreed to in the Partial Settlement Agreement, which imposes a $1.10/MWh charge in DEC and $2.39/MWh charge in DEP on "uncontrolled solar QFs" is reasonable for the purpose of this proceeding. The SISC should be a fixed amount during the term of the contracts for those QFs that establish a legally enforceable obligation during the availability of the rates established in this proceeding. The SISC in the foregoing amounts should apply prospectively only, and shall not apply to the rates established in prior avoided cost proceedings, nor shall it be binding with respect to any subsequent avoided cost proceeding.

11. It is not appropriate to impose the SISC on a solar QF that is a "controlled solar generator," meaning, generally, any solar QF that demonstrates that its facility is capable of operating, and contractually agrees to operate, in a manner that materially reduces or eliminates the need for additional ancillary service requirements incurred by the utility.

12. Therefore, DEC and DEP should be required to file with the Commission proposed guidelines for QFs to become "controlled solar generators" and thereby avoid the SISC.

VIII. CONCLUSIONS OF LAW

After hearing the evidence and testimony of the witnesses, the Commission finds and concludes that certain proposals made by Duke Energy pursuant to PURPA Section 210 and EFA Section 58-41-20 are not reasonable or prudent as initially proposed in these proceedings, given the evidence introduced by CCL and SACE, SBA, and ORS, which raised the specter of imprudence that Duke Energy failed to overcome with substantiating evidence. Duke Energy's application to the Commission for approval of the Companies' standard offer avoided cost methodologies, form contract power purchase agreements, and commitment to sell forms may be approved as reasonable and prudent if subject to certain conditions.

IT IS THEREFORE ORDERED THAT:

1. The following are not approved as proposed by the Companies, and are subject to conditions in Ordering paragraphs below:

    i. The Companies' Schedule PP and Standard Offer tariffs.

2. The Companies shall revise their Avoided Cost methodology and calculations pursuant to the EFA and PURPA and the following Ordering paragraphs, and shall file within 90 days of this order revised tariffs with rates reflecting such changes.

3. For their Avoided Capacity Calculations, the Companies shall:

    i. Recalculate capacity costs consistent with the seasonal capacity allocation previously approved by this Commission on May 4, 2016 in Docket No. 1995-1192-E, pending the filing of a report detailing the conclusions of a stakeholder process subject to the conditions in paragraph 5 and subsequent consideration of seasonal allocation by the Commission in future avoided cost proceedings.[126]

4. With respect to the current and future avoided cost proceedings, the Companies shall:

    i. Calculate capacity costs consistent with the Commission's finding that the avoided capacity cost of solar added to the system should be based on the amount of solar on the system today, and not on expected future solar levels.

5. With respect to the stakeholder process discussed in paragraph 3, the Companies shall develop and propose a process for stakeholders to review and provide input on its current and future resource adequacy studies, including input regarding:

[126] On December 17, 2015, the North Carolina Utilities Commission approved a "60%/40% weighting for summer and non-summer months for the proposed avoided capacity rates under DEC Option B and DEP Options A and B, and an 80%/20% (summer/non-summer) weighting for DEC Option A." On May 4, 2016, in Docket No. 1995-1192-E, this Commission approved DEP and DEC's proposal to use the avoided cost rates approved by the North Carolina Utilities Commission in that order. It is appropriate for DEC and DEP to temporarily default to these rates, which predated the flawed 2016 Resource Adequacy Studies.

i. The relationship between extreme cold and load;

ii. The drivers of sharp winter load spikes under extreme conditions and develop programs for shaving these rare and brief spikes; and

iii. The potential for load forecast error due to economic and demographic forecast errors, and the realistic extent to which this could lead to less capacity than planned in a delivery year and to inform future resource adequacy studies.

6. With respect to all future resource adequacy studies, the Companies shall:

   i. Develop and propose a process for stakeholders to review and provide input on proposed assumptions for future resource adequacy studies before those assumptions are finalized;

   ii. Develop and propose a process that affords stakeholders an opportunity to request details of model inputs and output, sensitivity analyses, and other model validation information before studies are finalized; and

   iii. Develop and propose a process that provides for up-front stakeholder review and feedback of future resource adequacy studies.

7. DEC and DEP shall identify and implement cost-effective demand side management programs that address and lower winter peak demand beginning in year 2020.

8. The October 21, 2019 Partial Settlement Agreement entered into by Duke Energy, SBA, JDA, and SACE and CCL regarding Duke Energy's proposed SISC represents a fair, reasonable, and full resolution of all issues in these proceedings regarding the SISC. With respect to the SISC, the Companies shall:

    i. Within fifteen (15) days the Companies shall filed revised Standard Offer and Large QF purchase power agreements, in redline and clean versions, that comply with the contract terms and conditions specified in the October 21, 2019 Partial Settlement Agreement.

Respectfully submitted this 12th day of November, 2019.

/s/ Lauren J. Bowen
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